Measures for working environment improvements at a factory

Hiromi Ariyoshi

Shimonoseki City University Research Institute for Industry and Culture
Noma 1-15-3-308 Minami-ku Fukuoka-City, Japan
Tel&Fax +81 92 562 2026
e-mail hiromi.ariyoshi@nishinippon-np.jp

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Abstract: This research is to clarify problems with the maintenance service section by the leadership of the health and safety committee at the occurrence of 3 absentees of low back pain. Tools were designed and used, however workers have to keep squatting posture in the arch (confined space within the rotary press) and it became worker’s heavy burden. Therefore, when the rotary press was renewed, the machine itself was improved. As a result, neither absentee by acute low back pain nor industrial accident had occurred.

1. Introduction

In our country, about 60 % of the occupational disease is lumbago in 2003 and it occupies the 1st place of the occupational diseases. 1) The lumbago not only decreases the will to work, but also becomes a cause of industrial accident. In recent severe economic situation, “A” newspaper company introduced new rotary and packaging machines with dismantling old machines since 1998. And the labor density of the employee has increased remarkably. This research regards working-posture-point measurement-results and ideas from the workshop as important, and clarifies the items for improvement at the renewal of the rotary machines. This is a report of tool designs and machine improvements for the purpose of lightning workers’ burden.

2. Materials and Methods

2.1 Materials

The business place for the research objective is a printing factory of a newspaper company. There are 98 male employees (average age 46.6±9.4 years as of April 1st 2005).
The working style is a shift system of day and night duty. The business comprises of operating the rotary machines for newspaper printing, carrying heavy such equipment as printing rollers, and tuning-up operations within the confined space of the rotary machine: those work environment is easy to cause low back pain. Employee health is managed by a full time occupational health nurse and a part time industrial physician (one afternoon two times a month).

2.2 Methods

(1) Actual status of the workshop

There were 3 absentees of low back pain a year later the rotary machine and packaging machine were installed in 1998.

A member of the Health and Safety Committee addressed, “Despite of carrying lighter stuffs, my back aches. This could attribute to a long squatting posture.” With this statement as a turning point, the industrial physician helped made a low back pain prevention table 2) and measured working posture points. The industrial health nurse, the Health and Safety Committee, and the maintenance service section had worked closely to design tools and carved the problems of the rotary machine in relief.

(2) Investigation of the number of absentee and low back pain

The number of acute low back pain, absentee, and labor accident were investigated for the period of 2000 to 2006 when the research had been practiced and 1999 when it wasn’t.

3. Results

3.1 Tool design

As the result of measuring working posture points, such special maintenance items as changing receive-and-deliver roller and chrome roller necessitate a long squatting posture and scores the highest. In addition, they have to work longer within the dark arch.

Those compel the hardest work. The Health and Safety Committee made a rule to use a legless
chair and hand-carry-light, and to wear a headlight for the operation within the arch. For tiny works, a further efficiency was pursued by designing a mirror stick with a light and a stick with a magnet on its head. Furthermore, the roller-carry-equipment (Figure-1) was invented to carry rollers smoothly into the arch.

![Figure-1 The roller carry equipment set at the arch entrance for roller change](image)

3.2 Renewal and improvement of the rotary machine

The above mentioned tools were used to improve the operation; however the roller change and adjustment were still heavy duty from the viewpoint of machine structure.

The maintenance service section stored all ideas and possible improvements submitted to the Health and Safety Committee on computer. And the section revealed improvement items to the management and machine manufacturer at the renewal of the rotary machine (Table 1).
management and machine manufacturer at the renewal of the rotary machine (Figure 2).

Table 1 Improvement part of machine

<table>
<thead>
<tr>
<th>Item</th>
<th>Front</th>
<th>Rear</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>In the arch</td>
<td>Closed</td>
<td>Opened</td>
<td>With 2 parts being opened (one mouth to double), putting rollers in and out, and machine adjusting operation became easier.</td>
</tr>
<tr>
<td>Width of the arch</td>
<td>560mm</td>
<td>680mm</td>
<td>Set up fluorescent light in the arch (Figure-2)</td>
</tr>
<tr>
<td>Width of the stairway</td>
<td>800mm</td>
<td>970mm</td>
<td>Ascent and descent on the stairway; machine tuning-up and roller exchange became easier.</td>
</tr>
<tr>
<td>Foot stand</td>
<td>width200 mm</td>
<td>None</td>
<td>Cylinder cleaning and putting plate on and off, etc became easier.</td>
</tr>
<tr>
<td></td>
<td>height200 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anti-slippery foot plate</td>
<td>1540x1500 mm</td>
<td>2600x1400 mm</td>
<td>Tuning-up operation like roller exchange became easier.</td>
</tr>
</tbody>
</table>

Figure-2 Put the fluorescent light permanently for the efficient operations in the arch
3.3 Investigation of the number of absentee and low back pain

Prior to this research, there were 3 acute low back pain and labor accident. But there had been neither absentee of acute low back pain nor labor accident during 2000 to 2006 after this research was engaged.

4. Consideration

For operators, the rotary machine, which was set in 1998, was no easy partner. The receive-and-deliver roller and chrome roller with their operating posture points being highly scored were built inside the machine. Therefore, many operations must be done within the arch.

To lessen the operators’ load, legless chair, etc was introduced. And the roller-carry-in-equipment was provided to ease the unnatural posture and realize a lighter low back burden. However, those meant little with the comparison of rewards from machine itself being improved. The operators’ slightly improved load hasn’t come yet to a thorough resolution. The machine improvement was no easy job since it comes with a huge budget. The maintenance service section collected advices from operators in the Health and Safety Committee as a data. The Committee called for the points for improvement to the management and machine manufacturer through the maintenance service section at the renewal of the machine. Especially, in this research, the operations in the arch, which most of operators felt cramped, eventually moved to enlarge the size of the rotary machine. For specifics, the space in the arch became larger and a fluorescent light was set (Figure-2) which ease the operations in the arch a lot. The width of the stairway on the rotary machine changed from 800 to 970mm and the width of anti-slippery foot plate from 540x1500 to 2600x1400mm for smoother roller carriage and tuning-up operations. The material of anti-slippery opening part, which is used for roller-carry-in, changed from iron to aluminum. Furthermore, the new machine has a structure for lighter rollers. The machine body was kept low to fit the average operator’s height: 172cm. And the foot stand, set aside the rotary machine, was given away. This foot stand size was 200mm wide and 200mm high that it could cause a topple-down. With no foot stand, operators don’t need to keep a forward-bent posture to clean the cylinder and put the plates on and off. All those lead to lessen the load on operators’ low back. The average age of printing section, for this research object, is 46.6±9.4 years. The operators of 40 years old and over compose of 74.4%. For this, it would be a proper time for low back pain to come out because of aging bones and weakening muscles 3). But the acute low back pain didn’t occur, since those measures ease the tension of low back muscle and lessen the burden around the low back for efficient operations.

According to Dr. Udoh 4), the participating-style-measures in workshop are said to be meaningful
for the improvements of the working environment. In this research, while the Health and Safety Committee collaborated with the maintenance service section, the data had been accumulated for the improvements. With more business sections being involved, the efforts for the measures of acute low back pain in 6 years have united the operators at the workshop, and a better work environment has developed. The working control sought by the industrial health ergonomics is to improve the problems of previously mentioned and to contribute to create the comfortable and enjoyable office environment of the first prevention 5). There had been no absentee of acute low back pain nor the labor accident during 2000 to 2006 while this research was engaged. It proves the research is quite meaningful for the measures against the acute low back pain. In addition, the easy operation at the workshop is now a well-known fact. The object operators for this research still remain in sever labor conditions, but the participating-style-health-control is to help grow their independence for self-realization 6,7) and to contribute to create comfortable work environments 8,9).

5. Conclusion

This research focused upon an organization of a drastically reorganized and their labor intensity increased ever and of its employees aging faster. Measuring working-posture-points is to grasp the reality of the workshop. And the improvements have come as far as the machine itself where the ordinal work control or work environmental control could not have afforded.

This means the squatting position, which operators felt most painful, was lessened. As a result, there haven’t been any labor accidents or absentees of low back pain so far. Above all, to engage in this research is meaningful and is to help create a comfortable work environment.

Reference Literature